MIRION TECHNOLOGIES

Radiation Safety. **Amplified.**

Reverse Electrode Coaxial Ge Detectors

(REGe)

Nuclear

Healthcare

Homeland Security & Defense

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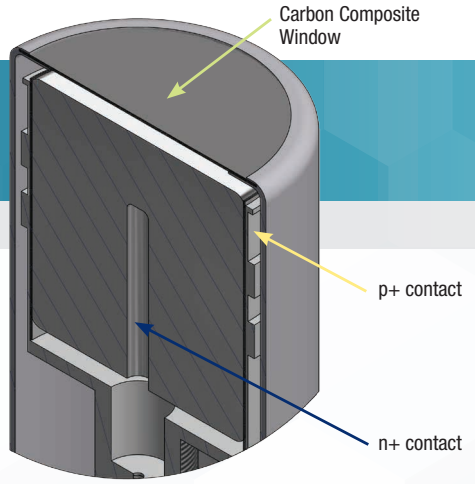
Industrial and Manufacturing



REGe Detector Configuration

KEY FEATURES

- Spectroscopy from 3 keV to >10 MeV
- Ultra-thin ion implanted contacts
- Radiation damage resistant
- Excellent timing resolution
- High energy rate capability
- Equipped with Intelligent Preamplifier
- Diode FET protection
- Warm-up/HV shutdown
- USB 2.0 Serial Interface

DESCRIPTION

The reverse-electrode detector (REGe) is similar in geometry to other coaxial germanium detectors with one important difference. The electrodes of the REGe are opposite from the conventional coaxial detector in that the p-type electrode, (ion-implanted boron) is on the outside, and the n-type contact (diffused lithium) is on the inside. There are two advantages to this electrode arrangement – window thickness and radiation damage resistance.

The ion-implanted outside contact is extremely thin (0.3 µm) compared to a lithium-diffused contact, enabling the REGe detector to cover a broad energy range from 3 keV up to several MeV. REGe detectors are normally equipped with a carbon composite window which is robust and provides excellent transmission to below 10 keV. Beryllium or aluminum windows are also available. Aluminum is preferred when there is no interest in energies below 20 keV and improved ruggedness is desired. Beryllium should be selected to take full advantage of the low energy capability (down to 3 keV) of the REGe detector.

It has been found that radiation damage, principally due to neutrons or charged particles, causes hole trapping in germanium. Unlike the case of the conventional coaxial detector, holes are collected by the outside electrode of the REGe detector. Since a much greater amount of the active detector volume is situated within a given distance, Δ R, of the outside contact, than of the inside contact (Volume $\approx R^2$) it follows that, on average, holes have less distance to travel if they are attracted to the outside contact than if they are attracted to the inside contact. With less distance to travel, they are less likely to be trapped in radiation damaged material. The extent of the improved resistance to radiation damage depends on other facts, of course, but experimental evidence suggests that the REGe detector may be 10 times as resistant to damage as conventional coaxial germanium detectors.

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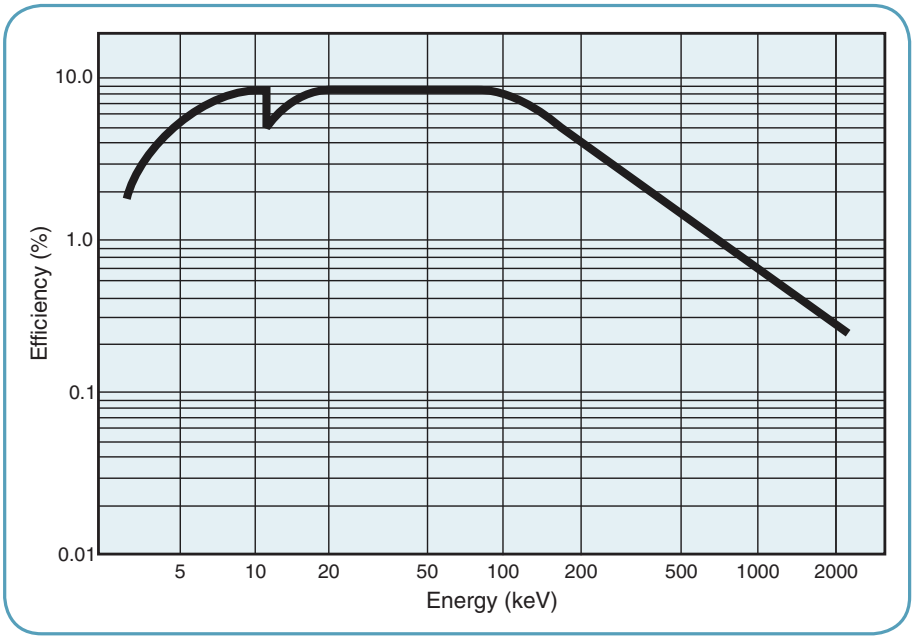

Typical Absolute Efficiency Curve for 15% REGe Detector with Be window with 2.5 cm detector to source spacing

SPECIFICATIONS

REGe GERMANIUM DETECTOR

General Specifications and Information

Standard configuration includes:

- Vertical Slimline dipstick cryostat with 0.6 mm Carbon Composite window and 30 liter Dewar.
- Model iPA – Intelligent Preamplifier with 3 meter bias, high voltage inhibit, signal and power cables.

See the “Cryostats, coolers & options” section for all information on available options and configurations.

The Intelligent Preamplifier (iPA) included with this style of HPGe detector has an improved, low power analog front stage providing excellent resolution and count rate performance.

An integrated digital back-end makes use of the detector sensors to continuously monitor and store all relevant parameters and status information. This data, which may be trended over time, allows the user to take preventative measures if a key parameter starts to shift and ultimately improves equipment availability and productivity.

It also enables setup and tuning of the preamplifier through digital controls rather than potentiometers.

The preamplifier status information, on board log file and digital controls are accessible through a USB 2.0 serial connection and software application which is provided with the iPA.

See the “Intelligent Preamplifier” specification sheet for more details.

The REGe detector is guaranteed to give a 22 to 88 keV intensity ratio of greater than 18:1. This ratio is only achievable with the carbon composite and beryllium window.

Reverse Electrode Coaxial Ge Detectors (REGe)

Model Number	Relative Efficiency (%) ≥	Full Width Half Max (FWHM) Resolution (keV)		Peak to Compton Ratio (P/C)	Peak Shape	Endcap diameter mm (in.)
		At 122 keV energy	At 1.3 MeV energy		FWTM/ FWHM	
GR1018	10	0.825	1.8	38	1.90	76 (3.0)
GR1020	10	1.00	2.0	34	2.00	76 (3.0)
GR1518	15	0.825	1.8	44	1.90	76 (3.0)
GR1520	15	1.00	2.0	40	2.00	76 (3.0)
GR2018	20	0.850	1.8	50	1.90	76 (3.0)
GR2020	20	1.10	2.0	46	2.00	76 (3.0)
GR2519	25	0.850	1.9	54	1.90	76 (3.0)
GR2521	25	1.10	2.1	50	2.00	76 (3.0)
GR3019	30	0.875	1.9	56	1.90	76 (3.0)
GR3021	30	1.20	2.1	52	2.00	76 (3.0)
GR3519	35	0.925	1.9	56	1.90	76 (3.0)
GR3521	35	1.20	2.1	52	2.00	76 (3.0)
GR4020	40	0.925	2.0	56	1.90	76 (3.0)*
GR4022	40	1.20	2.2	52	2.00	76 (3.0)*
GR4520	45	0.950	2.0	58	1.90	83 (3.25)
GR4522	45	1.20	2.2	54	2.00	83 (3.25)
GR5021	50	1.00	2.1	58	1.90	83 (3.25)*
GR5023	50	1.20	2.3	54	2.00	83 (3.25)*
GR5522	55	1.10	2.1	60	2.00	89 (3.5)
GR5524	55	1.25	2.3	54	2.10	89 (3.5)
GR6022	60	1.10	2.2	60	2.00	89 (3.5)
GR6024	60	1.25	2.4	54	2.10	89 (3.5)
GR6523	65	1.20	2.3	60	2.00	89 (3.5)
GR6525	65	1.30	2.5	54	2.10	89 (3.5)
GR7023	70	1.20	2.3	60	2.00	89 (3.5)*
GR7025	70	1.30	2.5	54	2.10	89 (3.5)*

For availability of detectors above 70% relative efficiency consult factory.

Model Number	Relative Efficiency (%) ≥	Full Width Half Max (FWHM) Resolution (keV)		Peak to Compton Ratio (P/C)	Peak Shape	Endcap diameter mm (in.)
		At 122 keV energy	At 1.3 MeV energy		FWTM/ FWHM	
GR8023	80	1.20	2.3	60	2.00	95 (3.75)
GR8025	80	1.30	2.5	56	2.10	95 (3.75)
GR9023	90	1.20	2.3	60	2.00	95 (3.75)
GR9025	90	1.30	2.5	56	2.10	95 (3.75)
GR10024	100	1.30	2.4	60	2.00	95 (3.75)*
GR10026	100	1.40	2.6	56	2.10	95 (3.75)*

* Note: Due to variations in crystal size endcap diameter may be larger. For guaranteed endcap diameter or custom specifications and hardware customization consult factory.

Above specifications are in accordance with IEEE Std 325-1996. Resolution performance is tested with Lynx® digital MCA. For resolution performance guarantee using other CANBERRA digital MCAs consult factory.

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